

Sealing Technologies for Repetitive Use in Abrasive, Electrostatic, High Vacuum Environments, Phase I

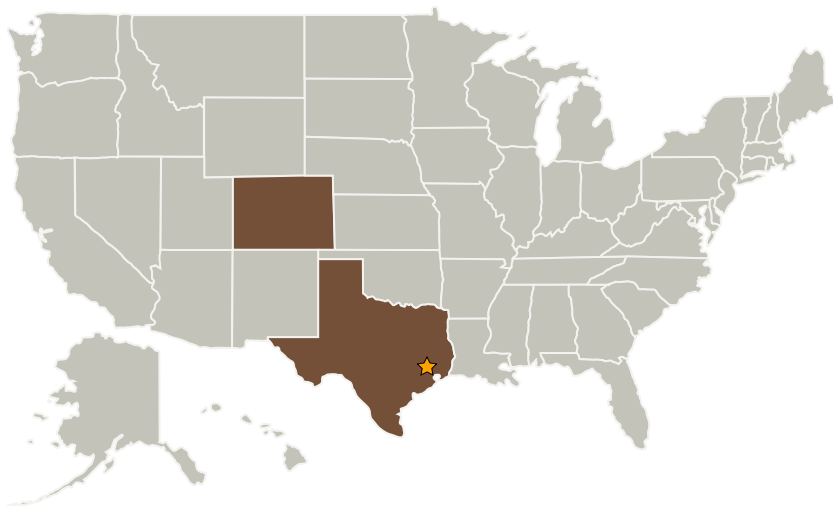
Completed Technology Project (2008 - 2008)



Project Introduction

Clearly, the presence of lunar dust has the propensity for major adverse impacts on dynamic mechanical systems required for future lunar operations such as Rovers, Robotic Systems, In-Situ Resource Utilization (ISRU) and science experiments. As such, the development of innovative techniques for mitigating dust affects is warranted. In abrasive environments such as the presence of regolith dust on the moon, mechanism seals must be either designed for robustness to avoid premature damage and leakage, or, the dust particles must be removed. For this SBIR, Starsys proposes an enabling all-metal, knife-edge seal capable of maintaining seal integrity even in the presence of the abrasive, lunar dust. The proposed Knife Edge Seal concept provides for an innovative mechanism by which to seal critical ISRU mechanisms even in the presence of lunar dust contamination. Starsys' knife edge seal approach will utilize a hard metal knife edge and seal gland filled with an Indium alloy. The knife edge geometry is sized to allow for low forces required to penetrate the Indium, while the gland geometry is sized to properly and reliably capture the Indium. The Indium is a phase change material available in a variety of alloys to target specific melting points. The Knife Edge Seal offers two distinct advantages when attempting to mitigate the affects of lunar dust; 1) the knife edge will penetrate any dust layer developed on the seal gland surface and embed itself into the gland material, and 2) the Indium can be heated and re-flowed in between mate and de-mate cycles, allowing the dust particles to mix in with the soft Indium material and most likely eliminating sufficient barrier between the knife edge and Indium to allow for sufficient sealing to occur.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
SpaceDev, Inc.	Supporting Organization	Industry	Louisville, Colorado

Primary U.S. Work Locations	
Colorado	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Scott Christiansen

Technology Areas

Primary:

- TX07 Exploration Destination Systems
 - └ TX07.2 Mission Infrastructure, Sustainability, and Supportability
 - └ TX07.2.5 Particulate Contamination Prevention and Mitigation